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10/630,824	07/30/2003	Shin Aoki	RCOH-0096DIV	8147

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EXAMINER
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HENN, TIMOTHY J

ART UNIT	PAPER NUMBER
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2622

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/630,824	<b>Applicant(s)</b> AOKI ET AL.	
	<b>Examiner</b> Timothy J. Henn	<b>Art Unit</b> 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-22, 24-36, 38-48, 50 and 51 is/are rejected.
- 7) ☒ Claim(s) 11, 23, 37 and 49 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 4-10, 12-14, 17-22, 24, 27, 30-36, 38-40, 43-48 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hieda et al. (US 5,548,330) in view of Crane et al. (US 5,901,242).

#### **[claim 1]**

Regarding claim 1, Hieda discloses a method comprising: placing over a unit area a predetermined spatial pattern of color specific photo elements in a sensor, each of the color-component specific photo elements filtering a single predetermined color-component over one of sub-unit areas in the unit area, each of the color component-specific photo elements corresponding to a single pixel (Figure 14; Figure 1, Item 102); sampling color image data at the sensor (Figure 1; i.e. exposing the CCD sensor to light and reading out an image); generating and adjusting chroma values for the color component specific elements from the color image data (Figure 1, Items 104-114); and estimating an intensity value based on the adjusted chroma values and the color image data (Figure 1, Items 118-122). However, Hieda does not explicitly disclose that

Art Unit: 2622

chroma and luminance values are generated and estimate for each pixel as claimed.

Official Notice is taken that it is well known in the art to generate chroma and luminance data for each pixel to obtain color image data without losing resolution. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to generate chroma and luminance data for every pixel to avoid losing resolution. While Hieda discloses generating chroma values, Hieda does not disclose using coefficients that spatially correspond to a specific set of color-component specific photo elements as claimed.

Crane discloses a method of interpolating missing image color data whereby a matrix of coefficients corresponding to a pixels location, and interpolated pixel data is generated and saved based on the coefficients and the values of the surrounding pixel data (Figure 4). Interpolation of pixels as described by Crane fills in missing color signals and allows for more accurate determination of luminance and chrominance signals at each pixel location. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to include interpolation as taught by Crane in the camera of Hieda so that the RGB data which is used to form the color-difference and luminance signals is not missing any color data in each pixel location. Since the RGB signals of Hieda in view of Crane are determined using coefficients which vary according to a spatial pattern, and the color difference signals are determined using the RGB signals, the color difference signals would be adjusted "based on" the coefficients as claimed.

**[claim 4]**

Regarding claim 4, Hieda discloses the use of RGB data for forming chroma data (Figure 1, Item RGB and Item 105).

**[claim 5]**

Regarding claim 5, Hieda discloses the use of a first matrix for converting the color image data to RGB (Figure 1, Item 105, Matrix).

**[claim 6]**

Regarding claim 6, Hieda discloses gamma converting the RGB data (Figure 1, Items 107a-107c).

**[claim 7]**

Regarding claim 7, Hieda discloses the use of a second matrix for converting the RGB data to chroma values (Figure 1, Item 109).

**[claim 8]**

Regarding claim 8, Hieda discloses the use of two matrices for image processing, but does not disclose combining them into a third matrix as claimed. Official Notice is taken that matrix operations involving multiple matrices can be combined into a single operation by multiplying the matrices together to form a single transformation matrix. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make a third matrix corresponding to the first and second matrices to streamline the process by requiring only a single matrix operation instead of two separate matrix operations.

**[claim 9]**

Regarding claim 9, Hieda further discloses adjusting the chroma values based on a predetermined filter (Figure 1, Item 112).

**[claim 10]**

Regarding claim 10, the examiner notes that color image data inherently has a range as claimed.

**[claim 12]**

Regarding claim 12, Hieda discloses a system for improving color data comprising: a color image sensor having a predetermined spatial pattern of color-component specific photo elements for generating color image data (e.g. Figure 14A; Figure 1, Item 102), the color image sensor sampling the color image data for the unit area using the color-component specific photo elements, each of the color-component specific photo elements corresponding to a single pixel (Figure 1; i.e. exposing the CCD sensor to light and reading out an image); an chroma value generator connected to the color image sensor for generating chroma values (Figure 1, Items 104-114); and an intensity estimator connected to the chroma value generator and the color image sensor for estimating an intensity value based upon the chroma values and the color image data (Figure 1, Items 118-122). However, while Hieda discloses generating chroma and luminance data, Hieda does not explicitly disclose generating chroma data “for each pixel” as claimed. Official Notice is taken that it is well known in the art to generate chroma data for pixels through an interpolation process and to generate luminance or “intensity” data for each pixel to obtain an accurate image without loss of resolution. Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to use well known interpolation systems for creation of the chroma data of Hieda and to estimate intensity data for each pixel as claimed to obtain an accurate image without loss of resolution. While Hieda discloses generating chroma values, Hieda does not disclose using coefficients that spatially correspond to a specific set of color-component specific photo elements as claimed.

Crane discloses a method of interpolating missing image color data whereby a matrix of coefficients corresponding to a pixels location, and interpolated pixel data is generated and saved based on the coefficients and the values of the surrounding pixel data (Figure 4). Interpolation of pixels as described by Crane fills in missing color signals and allows for more accurate determination of luminance and chrominance signals at each pixel location. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to include interpolation as taught by Crane in the camera of Hieda so that the RGB data which is used to form the color-difference and luminance signals is not missing any color data in each pixel location. Since the RGB signals of Hieda in view of Crane are determined using coefficients which vary according to a spatial pattern, and the color difference signals are determined using the RGB signals, the color difference signals would be adjusted "based on" the coefficients as claimed.

**[claim 13]**

Regarding claim 13, Hieda in view of Crane discloses a chroma value generator (Figure 1, Item 104-114) which includes a spatial filter as claimed (Crane, Figure 4).

**[claim 14]**

Regarding claim 14, Hieda discloses a chroma value generator but does not specifically disclose a smoothing filter connected to the chroma value generator. Official Notice is taken that the use of smoothing filters to suppress drastic changes in chroma data is well known in the art to increase image quality. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a smoothing filter as claimed to increase image quality.

**[claim 17]**

Regarding claim 17, Hieda does not disclose a one dimensional image sensor. Official Notice is taken that one dimensional image sensor is an art recognized equivalent to two dimensional image sensors and can be used to capture image data by scanning the one dimensional image sensor across a scene. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a one dimensional image sensor instead of a two dimensional image sensor since such a sensor is an art recognized equivalent device.

**[claim 18]**

Regarding claim 18, Hieda discloses a two dimensional image sensor (e.g. Figure 14A).

**[claim 19]**

Regarding claim 19, Hieda discloses a color image sensor which is at least three by three (Figure 14A).

**[claims 20 and 21]**



Regarding claims 20 and 21, Official Notice is taken that median filters and low-pass filters are well known types of smoothing filters in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use median or low-pass filters since such filters are well known and commonly understood types of smoothing filters.

**[claim 22]**

Regarding claim 22, since the inputs to the system of Hieda include image data which by definition spans the range of all color component photo elements of the color image sensor (i.e. the input is the color component data), the intensity would necessarily be estimated "in a range equal to all of the color component specific photo elements" as claimed.

**[claim 24]**

Regarding claim 24, note that Crane discloses storing multiple sets of parameters and selecting a specific set of parameters based upon a particular location in the spatial patter (Figure 4, Steps S4-S12).

**[claim 27]**

Regarding claim 27, see claim 1.

**[claims 30-36]**

Regarding claims 30-36, see claims 4-10.

**[claims 38-40]**

Regarding claims 38-40, see claims 12-14.

**[claims 43-48]**

Regarding claims 43-48, see claims 17-22.

**[claim 50]**

Regarding claim 50, note that Crane discloses storing multiple sets of parameters and selecting a specific set of parameters based upon a particular location in the spatial pattern (Figure 4, Steps S4-S12).

4. Claims 2, 15, 16, 25, 26, 28, 41, 42 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hieda et al. (US 5,548,330) in view of Crane et al. (US 5,901,242) in view of Saito et al. (JP 07-093563).

**[claim 2]**

Regarding claim 2, Hieda discloses further adjusting the chroma values for an improved color characteristic (Figure 1, Items 113 and 114; fader multipliers), but does not disclose adjusting the intensity value for an improved edge characteristic and generating RGB data from the chroma and intensity values. Saito discloses including an edge enhancement to intensity data to produce a sharper image (Figure 1, Item 2) and converting chroma and intensity data to RGB signals (Figure 1, Item 4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include edge enhancement and RGB conversion to obtain sharper images and convert the intensity and chroma values to a RGB format which is commonly used

by display devices.

**[claim 15]**

Regarding claim 15, Hieda disclose the system of claim 14, however they do not disclose an edge enhancement filter connected to the intensity estimator for enhancing an edge. Saito discloses such a system (Figure 1, Item 2) which is advantageous in that it results in a sharper image. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include an edge enhancement filter connected to the intensity estimator to obtain a sharper image.

**[claim 16]**

Regarding claim 16, Saito discloses that the output of the edge enhancement filter and the chroma signals (output by the smoothing filter of Shimizu) would be converted to RGB signals (Figure 1, Item 4). Such a conversion would be advantageous as it is a common format used in image display devices. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include an RGB converter so as to convert the intensity and chroma values to a RGB format which is commonly used by display devices.

**[claims 25 and 26]**

Claims 25 and 26 contain the limitations of claims 1 and 2 and the further limitation of being implemented as a program of instructions executable by a machine. Official Notice is taken that the use of software to implement image processing steps and which is embodied on a computer readable medium is notoriously well known in the art as an easy method for creating image processing systems using general purpose

processing elements instead of specially created application specific chips. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the method of Hieda using software embodied on a computer readable medium. For further details see the rejection of claims 1 and 2 above.

**[claim 28]**

Regarding claim 28, see claim 2.

**[claims 41 and 42]**

Regarding claims 41 and 42, see claims 15 and 16.

**[claim 51]**

Claim 51 contains the limitations of claims 27 and 28 and the further limitation of being implemented as a program of instructions executable by a machine. Official Notice is taken that the use of software to implement image processing steps and which is embodied on a computer readable medium is notoriously well known in the art as an easy method for creating image processing systems using general purpose processing elements instead of specially created application specific chips. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the method of Hieda using software embodied on a computer readable medium. For further details see the rejection of claims 27 and 28 above.

5. Claims 3 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hieda et al. (US 5,548,330) in view of Saito et al. (JP 07-093563) in view of Murata et

al. (US 5,333,055).

**[claim 3]**

Regarding claim 3, Hieda in view of Saito lacks gamma converting the RGB data after step h). Murata discloses a step of gamma converting RGB data (Figure 5, Item 102). Such a step is advantageous in that it provides an output signal at an appropriate level to an output device. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a gamma-converting step as claimed to provide an output signal at an appropriate level to an output device.

**[claim 29]**

Regarding claim 29, see claim 3.

***Allowable Subject Matter***

6. Claims 11, 23, 37 and 49 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

**[claims 11, 23, 37 and 49]**

Regarding claims 11, 23, 37 and 49 the prior art does not teach or fairly suggest an imaging system or method which estimates an intensity value using the claimed equations.

***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J. Henn whose telephone number is (571)272-7310. The examiner can normally be reached on M-F 11-7.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lin Ye can be reached on (571) 272-7372. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2622

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TJH  
3/19/2008

/Lin Ye/  
Supervisory Patent Examiner, Art Unit 2622